

**Powhatan Creek Watershed  
Management Plan**

**November 2001**

**FINAL**

**Prepared for:**

James City County, Virginia

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## Acknowledgments

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Special thanks are extended to the many individuals who attended the two stakeholder meetings and helped identify and prioritize goals for Powhatan Creek. Thanks are also extended to Albert McCullough of Sustainable Science for his assistance with the conservation area fieldwork and locating the elusive small whorled pogonia, Donna Ware of William and Mary for her assistance with information on rare species in Powhatan Creek and for responding to my many email inquiries. In addition, we would like to acknowledge the Virginia Natural Heritage program, especially Steve Carter Lovejoy, for their willingness to release specific locational information on rare species and for their excellent publications of conservation areas of the lower peninsula of Virginia. We would like to thank Patty Jackson, Jenny West and the staff at James River Association for their help with the fieldwork and stakeholder involvement.

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## **Executive Summary**

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This watershed management plan provides a summary of the findings from the Powhatan Creek baseline report, the three special studies and the stakeholder process conducted by the Center for Watershed Protection, the James River Association and James City County. A specific watershed management plan and accompanying maps have been drafted for the 12 subwatersheds based on the eight tools of watershed protection. The subwatershed maps serve as a blueprint for the protection and restoration of Powhatan Creek and may be used as planning maps during the implementation of the watershed management plan and as an important tool during the development review process.

The 22 square mile Powhatan Creek watershed is truly a state and national treasure with its historic past and present biodiversity. The mouth of the creek discharges to the James River near Jamestown Island, the site of the first permanent settlement in North America and a major tourist destination. The scenic Powhatan Creek is also notable for its exceptional biodiversity and bottomland wetlands. It was recently ranked as having the greatest significance for biodiversity and natural areas in the lower Peninsula of Virginia (Clark, 1993). Rare, threatened or endangered plants such as the small whorled pogonia, Virginia least trillium, and false hopsedge are found here. Bald eagle habitat and an important heron nesting colony are located within Powhatan Creek's expansive floodplain wetlands.

Rapid development seen in the last two decades poses a threat to water quality and natural habitats in Powhatan Creek. Impervious cover is an indicator of the extent and pattern of growth in the watershed, and this growth pattern over the years is very revealing. In 1970, watershed impervious cover was estimated to be 3%, but grew to 8% in 1998, 9.8% in 2000, and is projected to reach a maximum of 15.5% in the future. Prior research has shown that stream and wetland quality begins to decline when the amount of impervious cover in a watershed exceeds 10%. Based on our latest estimates, Powhatan Creek appears to be very close to crossing this key threshold.

The principal effects of impervious cover in Powhatan Creek include:

- Changes in hydrology of streams, wetlands and floodplains
- Increased pollutant loads delivered in urban stormwater (bacteria, sediment, nutrients)
- Channel erosion in headwater streams
- Water level fluctuations that degrade wetlands and rare, threatened, or endangered plant species habitat
- Favors the establishment of invasive plant species
- Fragmentation of contiguous forests
- Increased flooding

Based on a widely used stream classification model, eight subwatersheds were classified as sensitive and only four subwatersheds were classified as impacted in 1998. Recent growth in the watershed

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has been rapid, and as of 2000, six subwatersheds are classified as sensitive, and six are now classified as impacted. Based on future growth in the watershed, it is likely that all subwatersheds will shift to the impacted category under the current zoning in the coming decades.

Watershed residents and other stakeholders play a vital role in the creation of a watershed management plan. It is important to involve the citizens, businesses, and other interested parties in the development of a watershed plan, since they will have to live with the decisions which are made. Stakeholders also bring to the table the issues which are important to them. Their participation gives them a stake in the outcome and helps to ensure plan implementation. Two public meetings were held with watershed stakeholders; the first covered the baseline assessment and fieldwork which was performed by the Center, the second engaged participants in the process of setting goals for the subwatersheds as well as the watershed as a whole. The eight overall watershed protection and restoration goals identified by the stakeholders are:

1. Prevent further degradation of water quality in Powhatan Creek and maintain the outstanding quality of tidal and nontidal mainstem wetlands. Extend Resource Protection Areas (RPA) to protect all perennial streams and connected wetlands.
2. Maintain biological and habitat diversity and promote habitat connectivity by protecting wildlife and riparian corridors between watersheds, subwatersheds, and the tidal and nontidal portions of Powhatan Creek.
3. Develop an “affordable and effective” watershed management plan that can be implemented by James City County.
4. Establish a transparent and stream-lined permitting process, and provide cost effective and incentive based regulations or guidelines for “green” development.
5. Improve the existing mechanisms for completing stormwater maintenance and retrofitting, and develop a mechanism for adequate long-term funding.
6. Link the unique history and culture of Jamestown and Colonial Williamsburg with Powhatan Creek watershed protection. Implement the majority of the watershed plan by the 2007 Jamestown Celebration.
7. Promote watershed awareness and active stewardship among residents, community associations, businesses, and seasonal visitors through educational programs, recreational opportunities, and participatory watershed activities.
8. Restore the physical integrity of degraded headwater streams where possible and protect the high quality streams from the negative morphological effects associated with increased urbanization.

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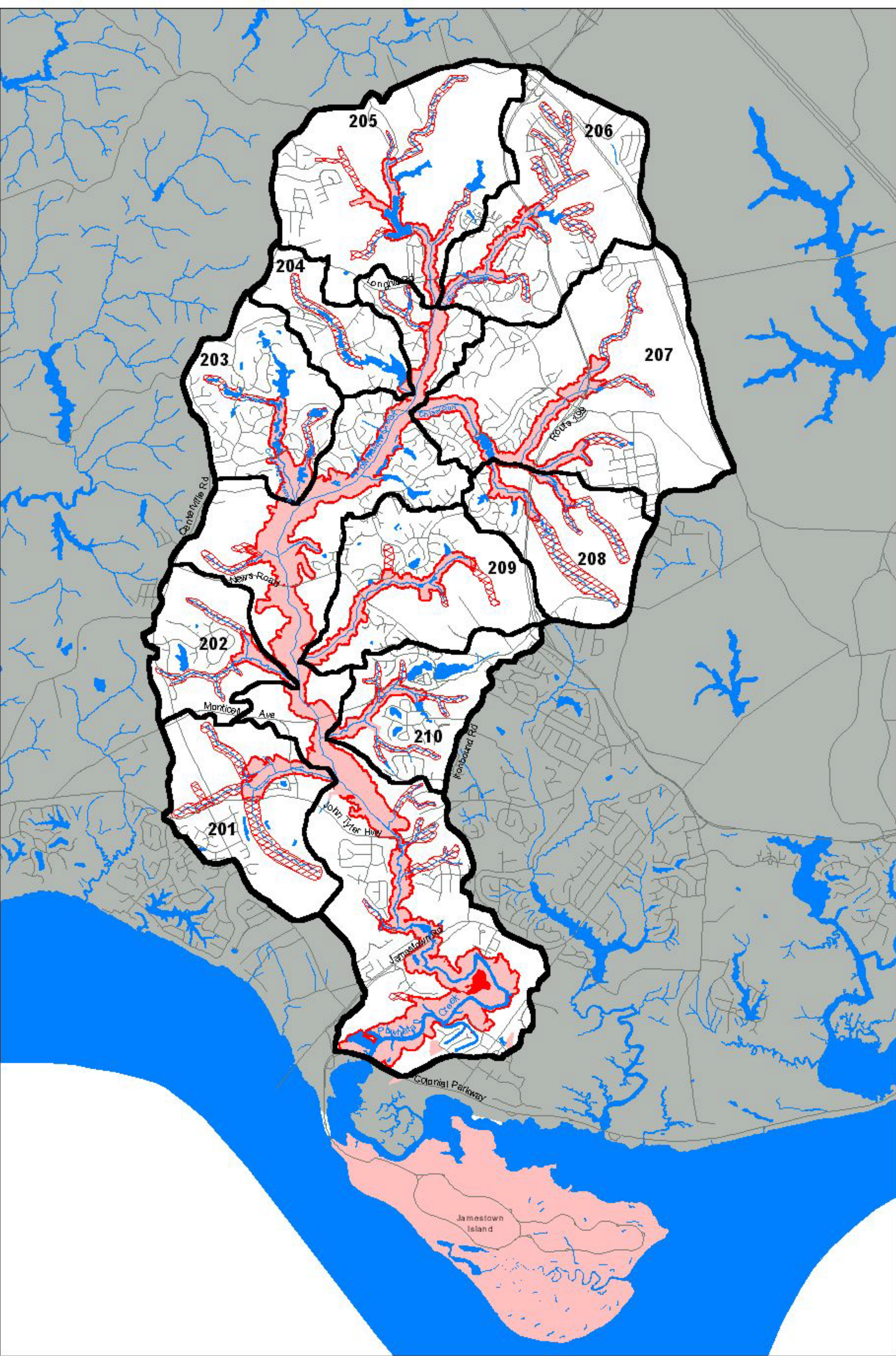
### Process

The 22 square mile Powhatan Creek watershed was divided into 12 subwatersheds from one to four square miles in area to create individual planning units (Figure 1). Land use and impervious cover were analyzed for each subwatershed in order to set expectations for current and future water quality and habitat conditions. Field conditions and conservation areas were evaluated to check expectations developed in the land use and impervious cover analysis. Together with the results of our conservation area work and the stream habitat assessment, draft goals were created for subwatersheds based on science and the existing and potential future land use. It was determined that Powhatan Creek includes a mix of relatively high quality subwatersheds with considerable biodiversity, a number of subwatersheds where stream conditions and habitat diversity have already been impacted by large regional stormwater ponds, and a high quality wetland complex along the mainstem.

A sensible philosophy was devised by the Center along with stakeholders to protect the high quality streams and conservation areas using land use and conservation tools. At the same, provide for additional development in degraded subwatersheds, with a goal of preventing further degradation by using stormwater retrofits, effective stormwater management, stream restoration, on-lot stormwater management and watershed education programs. In cases where development is going to occur in sensitive watersheds, special stormwater criteria, where impervious cover and stormwater runoff are reduced, have been created in order to reduce the impacts. In addition, the mainstem tidal section was designated as a Sensitive Resource Area, which reflects the need for special tools to help protect the significant natural resources of this area. The stakeholder process helped develop a broad consensus for these goals and added even more specific goals for both the entire watershed and individual subwatershed planning units. A summary of the individual subwatershed goals is as follows:

<b>Table E-1. Subwatershed Goals</b>			
<b>Subwatersheds</b>	<b>Current Status / Future goal</b>	<b>Watershed Goals</b>	<b>Tools</b>
201, 202, 205, 208, 209, Mainstem nontidal	Sensitive / Sensitive  <i>less than 10% impervious cover</i>	Preserve important conservation areas, sensitive streams and contiguous forest	Conservation easements, land acquisition, limit re-zoning, open space transfer; when development does occur -- cluster and use Special Stormwater Criteria (SSC)
203, 204, 206, 207, 210	Impacted / Impacted  <i>10 -25% impervious cover</i>	Reduce pollutant sources, improve pond aesthetics and uptake, restore degraded streams and protect streams from further degradation	Direct development here, implement watershed education and stewardship programs, stormwater retrofits, on-lot stormwater practices, and stream restoration, consider up-zoning





**LEGEND**

- Watershed Boundary
- Subwatershed Boundary
- Current RPA and RPA Buffer
- Recommended RPA Extension
- Hydrology

# Powhatan Creek Watershed

4000 0 4000 Feet

Scale bar and north arrow.



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Mainstem Tidal	Impacted / Impacted  <i>13.6%</i> <i>impervious cover</i>	<b>Sensitive Resource Area</b> Minimize increases in impervious cover, maintain high quality of wetland habitat, maintain buffers for the preservation of marsh wildlife communities and water quality	Increase buffer, cluster to preserve buffer, open space design, limit up-zoning, open space trading
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### Recommendations

Prioritized implementation recommendations for the Powhatan Creek watershed are summarized in Table E-2. Preliminary cost estimates and potential responsible parties have been identified so that financial resources can be allocated and staff roles can be defined. Real watershed protection requires a multi-faceted approach which combines land use decisions with on-the-ground implementation, education and protection of watershed functions. This approach strives for permanent protection, and attempts to minimize long-term costs by implementing proactive, preventative solutions. This method is not inexpensive, our estimate is \$300,000 a year over 5 - 6 years, this number would increase with a larger open space acquisition or conservation easement program. Long-term protection of water quality, fisheries, quality of life and biodiversity have quantifiable community benefits including increased property values and enhanced quality of life, which compound over time. More details on the economic benefits of watershed protection can be found in Appendix A.

Another key component of this watershed plan is measuring and monitoring the success of the plan. In Powhatan Creek, this consists of monitoring the effects of management measures on stream channel stability, water quality, RTE species and impervious cover. This will enable county staff to learn from the successes and challenges of plan implementation and craft better strategies in the future.

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<b>Table E-2. Priorities and Costs for Watershed Protection and Restoration in Powhatan Creek</b>					
<b>Priority</b>	<b>Goals Achieved</b>	<b>Protection Tool or Evaluation Measure</b>	<b>Where</b>	<b>Costs to JCC and Action</b>	<b>Responsible Party</b>
1	1,2,3	Use subwatershed maps to review future development projects, negotiate proffers, and review re-zoning requests	Watershed wide	Minimal <i>Use the subwatershed maps created by the Center</i>	JCC Planning, Development Management, Environmental Division
2	1,2,3	Implement new RPA boundary based on perennial streams	Watershed wide (See Map in Appendix D)	Minimal <i>Use the new layer created by CWP (perhaps further improve with help of William &amp; Mary)</i>	JCC Environmental Division
3	1,2,3	Prohibit re-zoning which increases impervious cover in sensitive subwatersheds	Sensitive subwatersheds (201, 202, 205, 208, 209, tidal and non-tidal mainstem).	Minimal <i>Policy change</i>	Planning Board
4	1,2,3,4	Cluster down - Ability to reduce lot sizes in low density zoning areas to create additional open space	Sensitive Subwatersheds (201, 202, 205, 208, 209, Tidal and non-tidal Mainstem)	Small 0.1 FTE (Full-Time-Employee) Watershed Planner <i>Ordinance or code change or Overlay zone</i>	JCC Planning

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5	1,2,3	Open Space Trading or Fee-in-lieu-- to acquire conservation areas and mainstem buffers (reduced open space requirement in certain watersheds in exchange for protection of conservation areas and the mainstem buffer)	Subwatersheds (203, 204, 206, 207, 210)	Minimal 0.1 FTE Watershed Planner <i>Ordinance or code change or Overlay zone</i>	JCC Planning
6	1,2,3,6	Purchase conservation easements in conservation areas and along mainstem buffers (Table 1.3 and Figure 2)	Sensitive subwatersheds (201, 202, 205, 208, 209, tidal and non-tidal mainstem).	Very Expensive (1million per year) <i>Goal: Preserve 250 - 300 acres a year over 6 years</i>	JCC Planning, Development Management, Williamsburg Land Trust
7	1,2	Special stormwater criteria in sensitive stream areas and conservation areas	201, 202, 203 (small section), 205, 208, 209, tidal and non-tidal mainstem	Small <i>stormwater ordinance change</i>	JCC Environmental Division
8	3	Hire a watershed planner/restoration coordinator	County wide	Expensive 1.0 FTE Watershed Planner \$35 to \$40K a year <i>Implementation of watershed plan</i>	Environmental Division

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9	1,5,8	Stormwater retrofits	201, 202, 205, 206, 207, 210	Expensive \$60k / year <i>Retrofit two facilities a year for 5 years (could be paid for with stormwater utility)</i>	JCC Environmental Division / Watershed Planner/ Restoration Coordinator
10	1,5	Long term maintenance of stormwater facilities / Stormwater utility	Watershed Wide	Expensive 0.5 FTE Stormwater engineer <i>Creation of a stormwater utility</i>	Planning board/ JCC Environmental Division
11	1,3,4	Impervious cover limit of 10%	208, 209	Small 0.05 FTE Watershed Planner <i>Ordinance</i>	JCC Planning
12	1,3,7,8	Expand BMP homeowner education program to include lawn care and conversion, pet waste, car washing and other watershed behaviors	Watershed wide	Small \$5 to \$7.5K year (FOP) <i>CD included with powerpoint slides for presentations to HOAs</i>	JCC Environmental Division/ Friends of Powhatan Creek
13	1,3,4	Better site design	County wide	Small 0.1 FTE Watershed Planner <i>Zoning changes</i>	Planning division

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<b>Table E-2. Priorities and Costs for Watershed Protection and Restoration in Powhatan Creek</b>					
<b>Priority</b>	<b>Goals Achieved</b>	<b>Protection Tool or Evaluation Measure</b>	<b>Where</b>	<b>Costs to JCC and Action</b>	<b>Responsible Party</b>
14	1,3,4	Encourage Better Site Design across watershed –workshop with developers and planning staff	Watershed wide	Minimal <i>(streamlined review process) and workshop for review staff and developers (Center will make part of Yarmouth Stakeholder Involvement process)</i>	Center for Watershed Protection/ JCC Environmental Division
15	1,7	Golf course management task force to discuss potential improvements in turf management/nutrients, pesticides, buffer protection, stream crossings and invasive species	202, 203, 204, 207	Minimal 0.05 FTE Watershed Planner <i>Facilitate task force</i>	Fords Colony/ JCC Environmental Division
16	1,8	Restore three stream sections over 5 years	201,206,207,210	Expensive \$100k a year for five years Prioritize restoration sites Geomorphic prioritization (\$30k or staff time) <i>Oversee restoration projects</i>	JCC Environmental Division Watershed Planner/ Restoration Coordinator
17	1,3	Monitor the effects of the Special Stormwater Criteria (SSC), JCC's regular criteria and the stream restoration efforts on stream channels	Watershed wide	Small Estimate of \$10 - \$15k/year <i>Evaluate the effectiveness of protection and restoration efforts/criteria</i>	Environmental Division and Greg Hancock, William and Mary

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<b>Table E-2. Priorities and Costs for Watershed Protection and Restoration in Powhatan Creek</b>					
<b>Priority</b>	<b>Goals Achieved</b>	<b>Protection Tool or Evaluation Measure</b>	<b>Where</b>	<b>Costs to JCC and Action</b>	<b>Responsible Party</b>
18	1,2,3	Plan for & monitor the protection of the RTE species in New Town - monitoring should continue through the development process	Subwatersheds 208/209	Small \$5k a year <i>Evaluate the effectiveness of protection efforts</i>	Donna Ware, William and Mary
19	1,2	RPA signage with new development	Watershed wide	Small \$5 to \$10k/ year	JCC Environmental Division
20	6,7	Powhatan Creek Watershed Signs which link the 2007 Celebration	Mainstem bridge crossings	Small \$5k	JCC Environmental Division
21	1,2,7	Program for assisting landowners in buffer creation.	Watershed wide	Small 0.1 FTE Watershed Planner +\$6k for equipt <i>Work with schools to establish a seedling grow out station. Restoration coordinator or existing staff to help distribute trees.</i>	JCC Environmental Division - Restoration Coordinator, Friends of Powhatan Creek
22	1,2	Acquisition of priority conservation and other sensitive areas	Sensitive subwatersheds (201, 202, 205, 208, 209, tidal and non-tidal mainstem).	Minimal - (Redirect existing resources) <i>Target a portion of the Open Space acquisition fund to conservation areas in Powhatan</i>	JCC Parks and Recreation Division

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<b>Table E-2. Priorities and Costs for Watershed Protection and Restoration in Powhatan Creek</b>					
<b>Priority</b>	<b>Goals Achieved</b>	<b>Protection Tool or Evaluation Measure</b>	<b>Where</b>	<b>Costs to JCC and Action</b>	<b>Responsible Party</b>
23	1,3	Re-compute impervious cover for all subwatersheds in 5 years	Watershed wide	Small \$10-20K in year 5 <i>Re- compute impervious cover</i>	JCC GIS Department or CWP
24	1,5	Future regional stormwater facilities (2-3 over 5 years)	Options include: 204, 205, 206, 207, 208	Expensive (estimate 2-3 @ \$250k per facility) <i>Plan/ construct</i> <i>Have new users pay in</i>	Environmental Division
<b>Total</b>				<b>•Expensive</b> <b>2 FTEs</b> <b>\$1.5 million over 6 years</b> <b>Additional funds for conservation easements/open space protection</b>	



## Section I: Introduction

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The 22 square mile Powhatan Creek watershed is truly a state and national treasure with its historic past and present biodiversity. The mouth of the creek discharges to the James River near Jamestown Island, the site of the first permanent settlement in North America and a major tourist destination. The scenic Powhatan Creek is also notable for its exceptional biodiversity. It was recently ranked as having the greatest significance for biodiversity and natural areas in the lower Peninsula of Virginia (Clark, 1993). Rare, threatened or endangered plants such as the small whorled pogonia, Virginia least trillium, and false hopsedge are found here. Bald eagle habitat and an important heron nesting colony are located within Powhatan Creek's expansive floodplain wetlands.

Based on a widely used stream classification model, eight subwatersheds were classified as sensitive and only four subwatersheds were classified as impacted in 1998. Recent growth in the watershed has been rapid, and as of 2000, six subwatersheds are classified as sensitive, and six are now classified as impacted. Based on future growth in the watershed, it is likely that all subwatersheds will shift to the impacted category under the current zoning in the coming decades. Clearly, it will be important to balance future growth with protection of Powhatan Creek and its natural resources.

Three special studies were performed to gain a better scientific understanding of the stream system; these included the *Stream and Floodplain Assessment*, the *Conservation Area Study*, and the *Stormwater Management Masterplan*. The *Stream and Floodplain Assessment* consisted of an instream habitat survey for the majority of the non-tidal watershed and reported on stream channel stability and habitat conditions in each of the subwatersheds. The conservation area study identified the presence of Rare, Threatened or Endangered (RTE) species, contiguous forest and high quality wetlands and identified potential threats and impacts to their existence. The stormwater master plan developed specific stormwater criteria for subwatersheds, identified existing stormwater practices for retrofit possibilities, and located potential regional stormwater facilities. Summary findings are presented below; more detailed reports of each study are available.

### *Stream Habitat and Floodplain Assessment*

Stream habitat surveys show early and clear signs of stress in headwater streams. The influence of watershed development on the mainstem and tidal creek has been more difficult to detect, but these changes may be masked by the very recent nature of development, the extensive influence of beaver activity and the stormwater and open space requirements adopted by James City County in the past.

### **Outcomes**

- identification of 4 subwatersheds in excellent condition
- identification of 3 subwatersheds in good condition
- identification of 4 subwatersheds in fair condition
- identification of 6 potential locations for stream restoration (Table 1.2)

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Table 1.1 contains the subwatershed rankings for habitat conditions as well as the amount of impervious cover in each subwatershed.

<b>Table 1.1 Powhatan Creek Subwatershed Assessment Results</b>				
<b>Rank</b>	<b>Subwatershed</b>	<b>Impervious Cover</b>	<b>Habitat Score</b>	<b>Rating</b>
1	205	5.1%	168	Excellent
2	Mainstem non-tidal	3.8%	164	Excellent
3	208	5.8%	160	Excellent
4	209	5.3%	159	Exc./Good
5	202	6.4%	148	Good
6	207	16.4%	144	Good
7	210	18.6%	142	Good/Fair
8	204	10.0%	132	Fair
9	206	14.7%	128	Fair
10	203	10.5%	124	Fair
11	201	6.8%	114	Fair
N/A	Mainstem tidal	13.6%	NA	Important fishery, shellfish beds and history
**Further details can be found in the <i>Powhatan Creek Stream Habitat and Floodplain Assessment</i> (Brown, 2001).				

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<b>Table 1.2 Potential Stream Restoration Areas and Associated Retrofits</b>				
<b>Subwatershed</b>	<b>Catchment</b>	<b>Stream Reach *</b>	<b>Associated Retrofit (Rank)</b>	<b>Comments</b>
201	Stem	201	R201-1 (7 of 16)	Recommended wetland/stream restoration of the ditched and drained wetland/stream system. Note presence of RTE species.
206	201-1	102, 103, 104	--	Restoration associated with incised, degraded stream channel conditions found along active nick points in the northern tributary. Proposed regional pond to manage stormwater from new and existing development.
206		201	R206-1 (1 of 8)	
206	202-1	106	R206-3 (4 of 16)	Eroded channel and nick points downstream of dry pond serving Prime Outlets. Retrofit of dry pond proposed for construction in conjunction with the stream restoration.
207	101-1, 101-2	101	R207-2 (2 of 8)	The lower portion of this highly incised and degraded reach would benefit from proposed regional facility. Note: Adjacent land zoned for limited Industry/Business.
207	202-1	103	R207-4 (1 of 16)	Pond to control unmanaged runoff from development upstream of proposed stream rehabilitation
210	204-1	109, 204	R210-1 (9 of 16)	Highly incised channel. Retrofit of dry pond to provide channel protection in recommended in conjunction with stream rehabilitation.

\* Potential stream restoration reaches are denoted by blue crosshatches on the subwatershed management maps in Section 5. The stream reach numbering system is presented in Figure 8 and Figure 9 in the Powhatan Creek Watershed Stream and Floodplain Assessment Report (Brown, 2001).

### *Conservation Area Study*

Based on field surveys, current Resource Protection Area (RPA) boundaries (state regulated areas) do not protect all vulnerable streams or conservation areas. The boundaries may need to be expanded or another mechanism must be developed to protect these areas. Of critical concern are populations of rare, threatened and endangered species, such as Small whorled pogonia, Virginia least trillium, New Jersey rush, false hopsedge, and Torrey's peat moss, which are widely dispersed across the watershed, and often located outside RPA boundaries. These species are highly vulnerable to watershed development. In addition, while extensive floodplain forest areas are protected within the RPA, upland forest areas are becoming smaller and more fragmented, and may deserve greater emphasis in land conservation. In previously developed areas with only a small buffer on the

## Powhatan Creek Watershed Management Report

mainstem floodplain wetlands, invasive species have intruded into the wetland complex; these include Japanese knotweed, microstegium and phragmites.

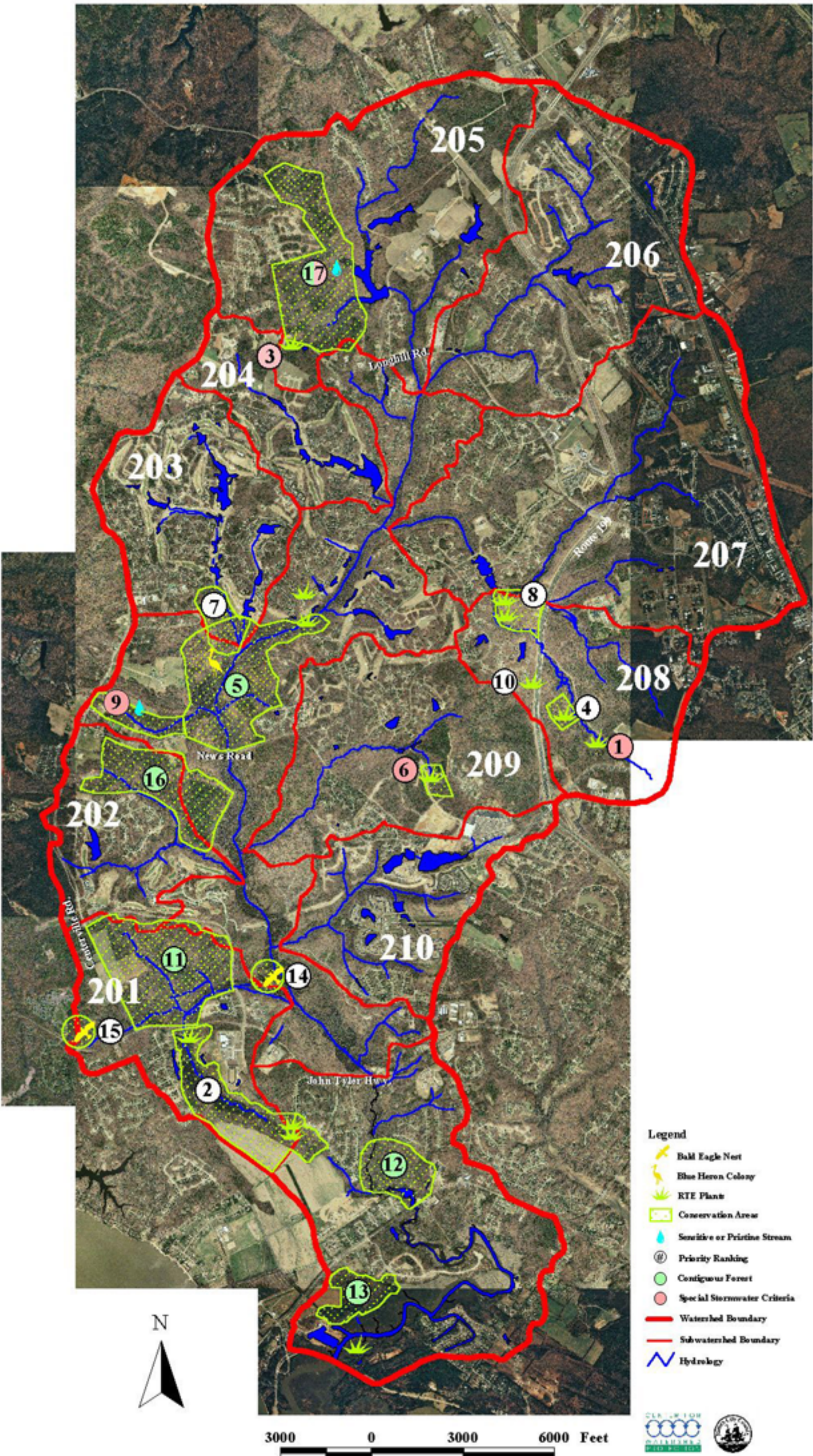
### Outcomes

- 17 priority conservation areas and management recommendations;
- 17 areas for land acquisition or easement (1800 total acres);
- Locations where the RPA protection should be extended;
- Recognition of the need for additional buffer to protect the high quality wetland complex of the tidal and non-tidal mainstem of Powhatan Creek (300 ft. minimum)

A description of the 17 priority conservation areas are listed in Table 1-3, as well as appropriate management recommendations. Figure 2 illustrates the locations of the conservation areas. One of the goals of the watershed management plan is to ensure the protection of these areas.

<b>Table 1.3 Powhatan Creek Conservation Area Priorities</b>				
<b>Rank</b>	<b>Conservation Area #</b>	<b>Description</b>	<b>Total Score</b>	<b>Management Recommendation</b>
1	C-25	VA least trillium New Town (NT)	64	Special Stormwater Criteria (SSC)
2	C-1/C-2/C-5	Paleochannel	59	Invasive Species Management
3	C-12/C-14	RTE wetland subwatershed 205	59	Special Stormwater Criteria
4	C-24	Small whorled pogonia (NT)	58	Greater Conservation
5	C-35	Contiguous forest/ heron rookery	57	Conservation/Acquisition
6	C-29	VA least trillium Jesters Ln	57	Conservation/Acquisition or SSC
7	C-9	Subwatershed 203 near rookery	55	Conservation/Acquisition
8	C-21	Small whorled pogonia 208 Ford's Colony (FC)	55	Conservation/Acquisition
9	C-34	High quality stream near News Rd.	54	Conservation/Acquisition or SSC
10	C-26	Small whorled pogonia (FC)	54	Conservation/ Management
11	C-4	Contiguous forest in 201	53	Conservation/Acquisition
12	C-41	Contiguous forest upper tidal	52	Conservation/Acquisition





**Figure 2: Powhatan  
Priority Conservation Areas**



## Powhatan Creek Watershed Management Report

<b>Table 1.3 Powhatan Creek Conservation Area Priorities</b>				
<b>Rank</b>	<b>Conservation Area #</b>	<b>Description</b>	<b>Total Score</b>	<b>Management Recommendation</b>
13	C-42/C-43	Contiguous forest lower tidal	52	Conservation/Acquisition
14	C-39	Eagles Nest above Rt. 5	52	Conservation/Acquisition
15	C-6	Eagles Nest on watershed border in 201	51	Conservation/Acquisition
16	C-7	Medium sized contiguous forest in 202	49	Conservation/Acquisition
17	C-13	Contiguous forest/ high quality streams in 205	49	Conservation/Acquisition or SSC
**Further details and scoring methods can be found in the <i>Powhatan Creek Conservation Area Report</i> (Sturm, 2001).				

### *Stormwater Management*

While JCC has strong stormwater management criteria, the existing management practices are not enough to protect highly sensitive and pristine subwatersheds from degradation. If development is to occur in these areas, special precautions and techniques should be used to protect the integrity of these areas. In areas with existing regional stormwater management, additional stormwater practices may not be needed, though on-site techniques such as rain gutter disconnection should be encouraged. The remaining areas can be developed within the current JCC stormwater management criteria. The watershed was divided into 64 catchments and stormwater management criteria which have been set for different types of catchments. Table 1.4 summarizes the eight top priority stormwater retrofit sites. More information on the stormwater management recommendations can be found in Section III.

### **Outcomes**

- Special Stormwater Criteria (SSC) for stream protection and conservation areas
- 8 priority stormwater retrofits (described in Table 1.4)
- 5 locations for potential regional facilities
- Stormwater criteria specifically for the tidal mainstem of Powhatan Creek to address water quality issues
- Locations for areas where the current stormwater criteria should be used
- Locations for areas where no additional stormwater management is needed

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**Table 1.4 Priority Stormwater Retrofits**

Rank	Retrofit	Drainage (acres)	Total Points	Description
1	R207-4	80	49	Proposed Extended Detention (ED) pond upstream of Longhill Rd, proposed stream rehabilitation downstream
2	R202-1	250	45	Modification of outlet structure of dry pond to provide channel protection
3	R205-2	120	45	Retrofit of an existing dry pond to provide channel protection
4	R207-3	70	39	Proposed expansion of existing pond to provide ED
5	R206-3	60	37	Outlet modification to provide channel protection at the Prime Outlets dry pond, also site of potential stream rehabilitation
6	R206-4	110	35	Outlet modification, possible micropool addition to dry pond
7	R208-2	30	27	Potential modification to outlet structure of wet pond to provide channel protection
8	R210-1	6	26	Potential modification of dry pond to provide channel protection, potential for conjunction with stream rehabilitation
**Further details can be found in the <i>Powhatan Creek Stormwater Master Plan</i> (Zielinski, 2001).				